

***Lucihormetica fenestrata* n.gen., n.sp., the first record of
luminescence in an orthopteroid insect
(Dictyoptera: Blaberidae: Blaberinae: Brachycolini)**

by

O. Zompro & I. Fritzsche

Dipl.-Biol. Oliver Zompro, Max-Planck-Institut für Limnologie, Arbeitsgruppe Tropenökologie, Postfach 165, August-Thienemannstraße 2, 24302 Plön, Germany.
Ingo Fritzsche, Zoologisches Institut der Universität, Lehrstuhl für Ökologie, Ohlshausenstraße 41, 24098 Kiel, Germany.

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Abstract

A new genus and species, *Lucihormetica fenestrata* n.gen., n.sp., of Blattodea, Brachycolini is described from Brazil. This seems to be the first orthopteroid insect genus ever reported as possessing organs of illumination. The new genus is closely related to *Hormetica* BURMEISTER, 1838 and *Parahormetica* BRUNNER VON WATTENWYL, 1865, but differs in the presence of organs of illumination and the morphology of its genitalia. A key to Brachycolini genera is compiled, and their type-species are listed.

Keywords: Dictyoptera, Blattodea, *Lucihormetica fenestrata* n.gen. n.sp., luminescence, Brazil.

Resumo

É descrita uma nova espécie e um novo gênero, *Lucihormetica fenestrata*, de Blattodea, Brachycolini, oriunda do Brasil. Aparentemente, este é o primeiro gênero de insetos ortópteroídeos relatado até o presente, que possui órgãos luminosos. O novo gênero está relacionado próximo à *Hormetica* BURMEISTER, 1838, e *Parahormetica* BRUNNER VON WATTENWYL, 1865, entretanto difere pela presença de órgãos luminosos e na morfologia de suas genitálias. Uma chave para os gêneros de Brachycolini é compilada e suas espécies-tipos são listadas.

Introduction

The new genus and species described, *Lucihormetica fenestrata* n.gen., n.sp., was one of the rare cases in Blattodea where the collector could personally give information about the living insect, so that it was possible to recognize the function of two kidney-shaped, yellow organs on its pronotum. The organs are luminescent, the first known case among all orthopteroid insects. Reviewing material in several collections it became obvious that actually several species of this group possess such organs, but their function could not be recognized in dry material. Re-examination of the type-species of related genera showed some generic differences, with the result that the new genus below differs from the closely related *Hormetica* BURMEISTER, 1838 and *Parahormetica* BRUNNER VON WATTENWYL, 1865, by the presence of the organs of luminescence and the morphology of its genitalia.

Lucihormetica n.gen.

A typical Brachycolini. The new genus differs from the closely related *Hormetica* BURMEISTER, 1838, and *Parahormetica* BRUNNER von WATTENWYL, 1865, by two kidney-shaped organs of luminescence on the pronotal disk and the morphology of the male genitalia. The L10' is located left of and not below L2' as in the other genera, this means a virtual elongation of the apex of L2' leaving the sclerotized and spinose part of L10' on its left side. The apices of L2' and via show the same direction and are at least subparallel to the axis of L2'. In the other genera this line is angled.

Type-species: *Lucihormetica fenestrata* n.sp.

The genus includes the following species, distributed in Brazil, Venezuela and Colombia:

Hormetica amazonica ROCHA E SILVA, 1987; *Brachycola interna* WALKER, 1868; *Hormetica seabrai* ROCHA E SILVA, 1987; *Brachycola subcincta* WALKER, 1868; *Hormetica tapurucuara* ROCHA E SILVA, 1979; *Hormetica verrucosa* BRUNNER VON WATTENWYL, 1865; *Hormetica cerdai* PÉREZ, 1992, *Hormetica osunai* PÉREZ, 1992 (all n. comb.) as well as *Lucihormetica fenestrata* n.sp.

List of genera of Brachycolinae (According to the catalogue of PRINCIS, 1963):

Bionoblatta REHN, 1940: 60.

Type: *Bion mastrucatus* REHN, 1937: 253, by monotypy.

Brachycola AUDINET-SERVILLE, 1839: 119.

Type: *Blatta sexnotata* THUNBERG, 1826: 276, pl. 14, by subsequent designation of KIRBY, 1904: 196.

Hormetica BURMEISTER, 1838: 511.

Type: *Hormetica laevigata* BURMEISTER, 1838: 511, by subsequent designation of KIRBY, 1904: 197.

Oxycercus BOLÍVAR, 1881: 470.

Type: *Oxycercus peruvianus* BOLÍVAR, 1881: 471, pl. 8: 2, by monotypy.

Parahormetica BRUNNER v. W., 1865: 385.

Type: *Brachycolia bilobata* SAUSSURE, 1864: 345, by subsequent designation of KIRBY, 1904: 197.

Phoetalia STÅL, 1874: 17.

Type: *Nauphoeta pallida* BRUNNER v. W., 1865: 286, by subsequent designation of KIRBY, 1904: 116.

Sibylloblatta REHN, 1937: 248.

Type: *Polyzosteria panesthoides* WALKER, 1868: 164, by monotypy.

The genera *Phoetalia* and *Oxycercus* were added by ROTH (1970), based on the characters of their genitalia.

Anchoblatta (SHELFORD, 1909: 620, type: *Anchoblatta peruana* SHELFORD, 1909: 620, by monotypy) was transferred from the Brachycolini to the Panchlorinae by ROTH (1972), again based on genital structures.

Key to genera of Brachycolini sensu ROTH, 1970:

1. Tegmina and alae reaching the apex of abdomen 2.
- Tegmina and alae not reaching the apex of abdomen 3.
2. Pronotum smooth, not tuberculated *Phoetalia*
- Pronotum tuberculated *Brachycola*
3. Arolia absent *Parahormetica*
- Arolia present 4.
4. Alae absent *Bionoblatta*, *Sibylloblatta*, *Oxycercus*
- Alae present 5.
5. Pronotal disk with two luminescent organs *Lucihormetica*
- Pronotal disk without two luminescent organs *Hormetica*

Lucihormetica fenestrata n.sp. (Figs. 1-4)

Material examined:

Holotype (male): Brazil, blackwater inundation forest at Rio Tarumã Mirim (02° 02'S, 60° 17'W) near Manaus, 1977, leg. J. ADIS; Paratypes: 1 female, 12 nymphs: same locality and collector, 29.-30.X.1980, 1.IV.1985.

The holotype, female paratype and 9 paratype nymphs are deposited in the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Brazil. 2 paratype nymphs in Coll. I. Fritzsche, 1 paratype nymph in Coll. O. Zompro.

The genitalia were treated with 10% KOH and added to the type in a tube. In alcohol.

A comparatively large member of Blaberidae: Brachycolini. General colour brown.

Male: Head roundly triangular, light brown, with a curved, dark brown H-shaped marking on frons. Clypeus nearly white, subrectangular. Labrum semi-circular, light brown, with a dark transverse marking. Eyes oval with dorsomedian impression, black, not projecting beyond the head, their distance being that of the width of clypeus. Ocelli wanting. Scapus club-like, longer than wide, round in cross-section, smooth and shiny. Length of pedicellus one-third of the previous segment. Third segment twice longer than pedicellus. Following segments ball-like, 1.5 times longer than wide, bristled from 12th segment on. Tip of left antenna broken off, right antenna missing.

Pronotum covering, but not projecting over the head, yellow-brown, disk brown. Pronotum sharply margined, with a prickly surface, irregular distally and in lines in proximal part, margin especially wide in anterior part, elevated, brown. Disk laterally with two swollen tubercles with a spiniform, upwards directed elevation. Interior margin of these horns touching the kidney-shaped, elevated organs of luminescence. Their surface pierced with several pores, inner part structured like a sponge. Pronotum from their median emargination to the anterior margin of disk with a truncated keel.

Tegmina almost reaching the distal end of abdominal segment VIII, with a broad, yellow, lateral

margin. Subcosta brown. Proximal part of tegmina with a transverse brown stripe. The part of tegmina covering the anal field and adjacent areas forming a rectangular, hyaline field, followed by a longer brown area. Posterior part hyaline, more than one-third as broad as brown part. Alae as long as tegmina, hyaline. Venation of anal field brown.

All coxae and trochanters light brown. Profemora as long as, mesofemora shorter, and metafemora longer, than the coxae. All femora unarmed, smooth, at apex dorsolaterally and ventrolaterally with one short spine, this sometimes broken off. Protibiae half as long as profemur, stout and dilating distad, darker, with several black, prominent spines. Mesotibiae two-thirds of, metatibiae one-fifth longer than femora, with comparably longer spines, especially so at dorsal edges. The latter elongated instead of club-like. Trochanters brown with a yellow margin. Tarsal segments brown, with light euplantulae. Unguis black, with a prominent, light arolium. Probasitarsus considerably shorter than the following three segments combined, half as long as propretarsus. Metabasitarsus longer than the following three joints, as long as pretarsus, arolium brownish. Mesotarsi missing.

Abdominal segments unspecialized. Distal segments more and more infusate, brown, with yellow margins. Abdominal segments II to IV more and more dilated, the succeeding ones narrowed. Segments II to IV ventrally lighter than the others. Segments III to IV with a black spot at the place of contact with tergosternal muscles. Segment VIII visible as a narrow stripe behind segment VII, 1.3 times as long as latter. Segments IX and VIII of similar length. Subgenital plate black, with a convex emargination at right margin (as typical for the *Blaberoid*-types), with a light margin. Cerci and styli missing. Paraprocts and roots of cerci with yellowish bristles.

Tergites unspecialized, dark brown, lateral margin yellow. Hind margin of supra-anal plate concave at the apex.

Genital apparatus (terminology as in KLASS, 1995):

Left complex divided into two different areas by a membranous fold. L3' with hla-appendix (R2), L2' (L2vm), via and L10' (L2d) sclerotized. L4U' and hla hook basally membranous. The tube built up by hla is marked by a curling. The sclerotized L3' in its distal part measures one quarter of the total length of hla. Hook directed to the right. hla ventrally with hge-groove produced. Left part of lv-apodeme characterized by three sclerites. lv-apodeme with L2'-sclerite. Proximal part lacking distinct edges, spoon-shaped with a 90° turn to the left-ventral part. Ventral edge of the turn more strongly sclerotized, distally with another 90° turn to the right, with its dorsal part more strongly sclerotized, apex acute. Distal part of left margin undulated, margins prominent. Elliptical via separated from L2' by a membrane, apex in the same direction as L2', left distal margin with stronger sclerotization, its apex neither touching L10' nor projecting. L10' strongly serrate at several levels, sclerotized part left of axis of L2'. Distolateral with 22 spines, 13 of them in the more strongly sclerotized part. Ductus ejaculatorius right beside L2'. Right phallomere at the same height as distal part of L2'. R1T' and R4' very strongly sclerotized, these sclerites united proximad, fda with an angle of 20°. Proximal margin of R1T' with two major projections. Opening of fda at a 45° angle to the axis of lv-apodeme.

Measurements (mm):

Body length: 42.0; width: 18.7; head: length: 8.0, width: 7.0; pronotum: length: 12.2, width: 17.5; tegmen: length: 30.5, width: 15.0; abdomen: width: 16.2; profemur: 7.9; protibia: 4.5; mesofemur: 7.9; mesotibia: 6.2; metafemur: 7.9; metatibia: 9.5.

Female: Head subglobose, yellow-brown. Ocelli wanting. Eyes kidney-shaped, blackish. Vertex as wide as clypeus, latter and labrum whitish. From clypeus to frons with a dark, triangular marking, its lateral margins lighter, showing similarity with the male H-shaped marking. Base of scapus surrounded by a dark margin, antennae dark, growing lighter towards apex. Scapus club-like, 1.5 times as wide as pedicellus, as long as pedicellus and third segment combined, these latter of same width. Antennal segments cylindrical, wider than long.

Pronotum ellipsoidal, covering the whole head. Anterior margin slightly elevated. Its median part elevated, considerably flattened laterally. Margin prominent, light in colour, covered with small, irregularly scattered holes. Disk trapezoidal, slightly elevated proximally, its anterior part dark, posterior part light. Tubercles almost invisible. Organs of luminescence absent. Median part of a dark brown disk with a light

furrow.

Tegmina reaching the supra-anal plate, hyaline, similar to the male in colouration, but its apex dark. Alae as long as tegmina.

Tergites unspecialized, posterior edge of V to VII slightly elongated. VIII laterally with stigma in its elongated part. VII twice as wide as VIII to IX. Laterally coloured lighter, median part darker. Tergites with a dark, transverse keel. Supra-anal plate semi-circular, margin with wide, light colouration. Cerci dark.

Sternites considerably rounded laterally, lateral margin light, transverse keel dark, stigmata visible from V on. Subgenital plate boat-like.

Meron part of meso- and metacoxae with a sharp keel. Femora unarmed. Protibia club-like, short. Tibia exteriorly with three rows of spines. Tarsi with euplantulae and arolia, white. Basitarsus as long as the following three segments combined. Unguis dark.

Measurements (mm):

Body: length: 40.0; width: 19.5; head: length: 7.0, width: 5.5; pronotum: length: 11.0, width: 16.5; tegmen: length: 23.5, width: 13.5; abdomen: width: 15.2; profemur: 4.5; protibia: 3.7; mesofemur: 7.2; mesotibia: 6.5; metafemur: 7.5; metatibia: 8.2.

Nymphs: Head roundly triangular. Frons and vertex yellow-brown, eyes black, ocelli wanting. A dark triangular marking reaching from clypeus to frons. Pronotum semi-spherical, posterior edges at the same level as posterior margin, not projecting as in adults. Anterior margin slightly elevated, with light spots on each side of head. Entire head covered by pronotum, tubercles not produced. Disk almost invisible. Posterior margins of tergites V to VII with small teeth, these directed upwards. Supra-anal plate roundly quadrate, subgenital plate oblong elliptical, with styli. Cerci directed upwards.

Name:

Lucihormetica: Shows close relationship with *Hormetica* plus the ability to produce light.

fenestrata: Derived from the window-like, hyaline area on the tegmina.

This striking species was found in *Streptocalyx poeppigii* BEER (Bromeliaceae) at an altitude of 5-21 m above ground-level on the following tree species: *Aldina latifolia* var. *latifolia* (Apiaceae), *Guatteria* sp. (Annonaceae), *Cynometra spruceana* var. *phaselocarpa* (Caesalpinaceae).

The living insect produced strong light (J. ADIS, personal communication). This ability of the males seems to be important because of the cryptic way of life of this species and to attract the females. This hypothesis finds support due to the presence of these organs only in the male sex and their absence in the females and nymphs.

Mr. Roth sent a hint on the genus *Minablatta* Rehn, 1940, possessing similar organs, which might be luminescent, too. From this genus, a member of Blattinae, *Lucihormetica* differs in the terminal segment of the palpi, which is as long as the previous and not 1.5 times as long, the deplanate pronotum with only flat, not striking structures and the basitarsus being longer than combined length of the following in *Minoblatta*, and being considerably shorter in *Lucihormetica*.

Notes:

In his catalogue, PRINCIS (1963) listed 16 species of *Hormetica*. ROCHA E SILVA (1979) first added two species, later (1987) further two. In the recent revision of PÉREZ (1992), another two species were described as new. That revision was highly superficial, ignoring the work of ROCHA E SILVA (1987) and mentioning no type-species of the genus revised. Consequently *Hormetica* sensu PÉREZ included several obviously polyphyletic species. ROTH (1970) found differences in genital morphology, but he did not draw conclusions.

Several authors like BRUNNER VON WATTENWYL (1865), WALKER (1868), ROCHA E SILVA (1979, 1987) and PÉREZ (1992) described new species, which all differed from the other members of Brachycolini in the two pale spots on the disk, which indeed are the organs of illumination. Even though the utility of these organs could not be appreciated based on dry material, this is a character which is hard to ignore. In the known species, these are kidney-shaped, with a sponge-like internal structure. The interior seems to be connected with the outside by a lot of small pores which probably serve for gaseous exchange.

These luminescent organs are very pale and easy to recognize in specimens kept in alcohol, as in the

type of the new species. The ability to produce light in the new genus is the first record of such a trait among all Orthoptera. The conformation of genitalic sclerites, especially the via and L10', and the spination of the latter, differ from the apparently closest genera *Hormetica* and *Parahormetica* as well as from all other known Brachycolini (ROTH 1970). This alone seems sufficient to erect a new genus.

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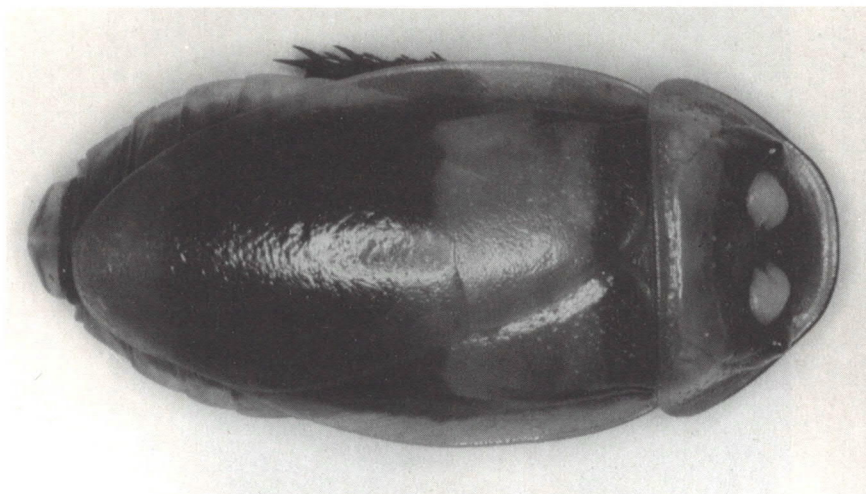


Fig. 1:
Luciormetica fenestrata n.sp. male holotype.

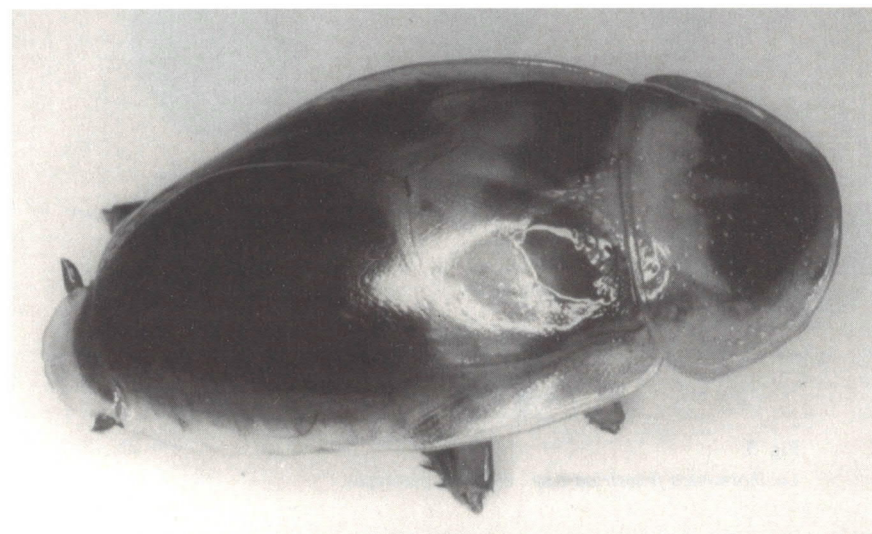


Fig. 2:
Luciormetica fenestrata n.sp. female paratype.

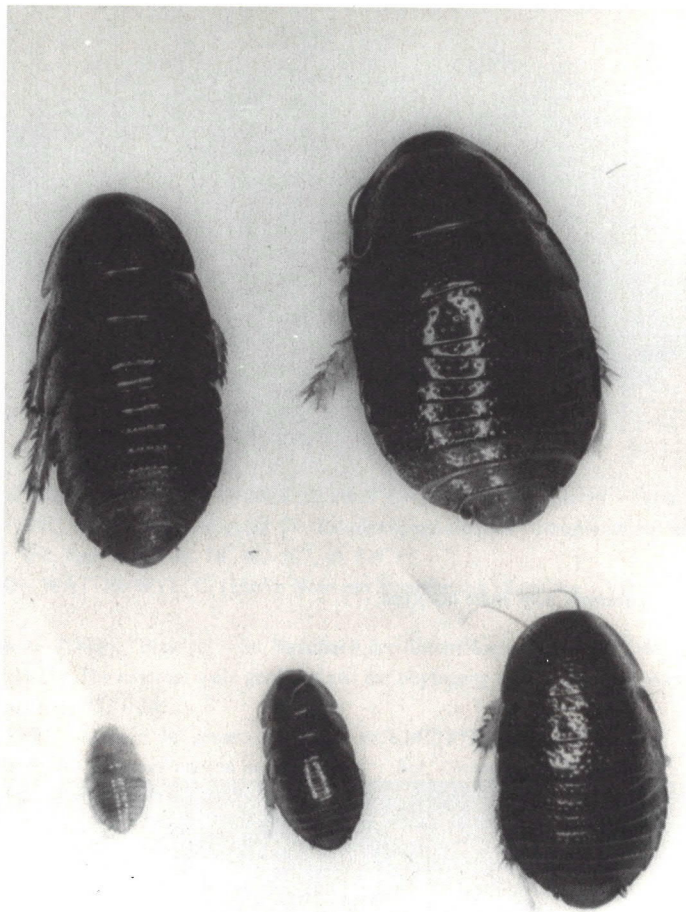


Fig. 3:
Lucihormetica fenestrata n.sp., nymphs, paratypes.

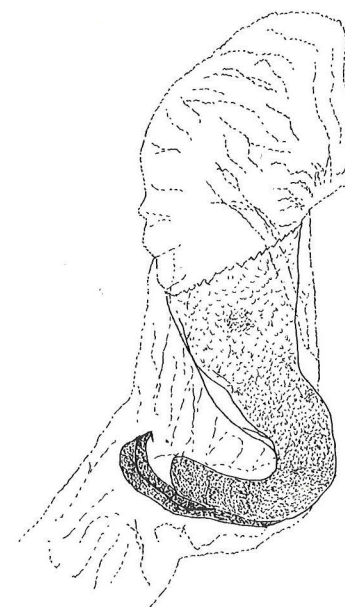
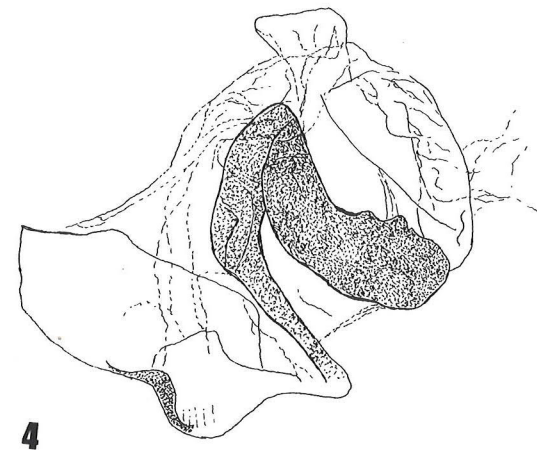


Fig. 4:
Lucihormetica fenestrata n.sp. male holotype. L2', via, L10', dorsal, 90 x.

Fig. 5:
Lucihormetica fenestrata n.sp. male holotype. Right phallomeres, dorsal, 90 x.

Fig. 6:
Lucihormetica fenestrata n.sp. male holotype. hla with sclerotized L3', ventral, 90 x.